

**Executive Summary**  
**Army Open System Demonstration Project**  
**Tank-Automotive Research Development and Engineering Center (TARDEC)**  
**PNUM 5A**

**Background:** Over the years, the amount of software in ground combat vehicles has grown from several hundred lines of assembly code to tens of thousands of lines of code written in higher level languages. As this trend continues with increased emphasis on digitization, the Army is challenged to find ways of reducing escalating software development and maintenance costs in order to function within today's budgetary constraints. The Joint Technical Architecture - Army (JTA-Army), the Army's building codes for software development, addresses many of these challenges by mandating an open systems approach for software development. For several years, the Tank-Automotive Research Development and Engineering Center's (TARDEC's) Vetronics Electronics Architecture (EA) Team has been actively examining the use of open systems in ground combat vehicles to promote reuse and interoperability. In FY97 the EA Team became involved with the Open Systems Joint Task Force (OS-JTF) to support the continued development of standards applicable to ground vehicles and to provide feedback through testing and integration of software utilizing these standards. These activities complement work currently being performed by the EA Team in conjunction with the Army's Weapon System Technical Architecture Working Group (WSTAWG). The goal of the WSTAWG is to ensure the weapon systems sub-domains are adequately represented in the JTA-Army and to promote reuse and interoperability among systems across the different weapon system sub-domains.

The EA Team is an active participant within the IEEE Portable Application Standards Committee (PASC), the Society of Automotive Engineers (SAE) Operating System (OS) API working group, and the Army's WSTAWG. At the PASC meetings, team members concentrated their efforts on the real-time related standards and the Ada bindings. Specific PASC working groups the EA Team is involved with include the following:

- 1003.1d - Additional Real-Time Extensions,
- 1003.1h - Services for Reliable, Available, and Survivable Systems,
- 1003.1j - Advanced Real-Time Extensions,
- 1003.21 - Real-Time Distributed Communications,
- 1003.5c - Ada binding to Protocol Independent Interfaces, and
- 1003.5f - Ada binding to 1003.21.

Specific participation with the working groups include balloting on the POSIX 1003.21 and 1003.5c draft standards and assisting with the writing of the 1003.5f standard - the Ada binding to 1003.21.

Generate a functional requirements specification, as part of the Virtual Joint Technical Architecture (JTA) efforts, for using the JTA for the Army ground domain.

For the WSTAWG, the EA team led a study evaluating POSIX for use in ground combat vehicles. This study concluded there is much in POSIX that is useful for ground vehicles, but more work in the area remains. Specific deficiencies noted in the report were the lack of conformance tests for the real-time extensions and the Ada bindings, the lack of a POSIX profile suitable for weapon systems, and incomplete functionality. To overcome these deficiencies, the report recommended working with PASC and the SAE OS API working group to develop a POSIX profile suitable for ground vehicles, and to develop an operational environment (OE) that provides a migration path for emerging POSIX standards and provides functionality where POSIX is deficient. This OE would become a standard across the Army and would be used in the development of ground vehicles. The POSIX profile for weapon systems has been defined and is currently undergoing review by the Army weapon systems community.

There are several Army programs/projects benefiting from this work. These include the following systems:

- Bradley Fighting Vehicle (M2A3)
- Abrams System Enhancement Program (M1 SEP)
- Crusader

- Future Scout Vehicle
- Grizzly
- Wolverine

**Approach:** For FY 98, the EA team will continue the current level of support for open systems activities. The activities include direct support to IEEE PASC working groups. Direct PASC support will include attending the working group meetings for POSIX 1003.21, 1003.5c, 1003.5f, 1003.1d, 1003.1h, and 1003.1j. Additionally, the EA team will continue to ballot on 1003.21 and 1003.5c draft standards. The EA team also intends to join the ballot group for 1003.1h when the draft is released for ballot. The EA team also proposes to continue to develop the Ada binding to 1003.21. This includes participating in writing the actual standard as well as developing the Ada language operations that map to the 1003.21 Language Independent Specification.

In addition to directly supporting the PASC activities, the EA team will also support open systems activities more directly relating to Army weapon systems. This includes completing a POSIX profile for weapon systems and coordinating this profile with the SAE OS API working group. The EA team also proposes to develop a test suite to validate conformance to the weapon systems profile. The EA team also plans to continue their involvement with the Army's WSTAWG to include the continued development of a POSIX-based Operating Environment and an embedded map server interface standard. The EA team will also continue to apply open systems standards to internal research and development activities within TARDEC.